



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE

United States Patent and Trademark Office

Address: COMMISSIONER FOR PATENTS

P.O. Box 1450

Alexandria, Virginia 22313-1450

www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/799,652	03/15/2004	Jin-sung Lee	249/454	8579
27849	7590	01/23/2009		
LEE & MORSE, P.C. 3141 FAIRVIEW PARK DRIVE SUITE 500 FALLS CHURCH, VA 22042			EXAMINER RAHIM, AZIM	
			ART UNIT 3744	PAPER NUMBER
			MAIL DATE 01/23/2009	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/799,652

Applicant(s)

LEE ET AL.

Examiner

AZIM RAHIM

Art Unit

3744

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 October 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-7, 10-16, 18 and 21-25 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-7, 10-16, 18 and 21-25 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(c), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(c) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 10/27/2008 has been entered.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

4. Claims 1, 3-7, 12-16, 18 and 21-24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hisai et al. (US 2003/0192686) in view of Hara et al. (US 5,413,167) and Emoto (US 7,064,804).

Regarding claim 1, Hisai et al. discloses a baking system (fig. 3) having a holding unit (11) adopting a heat pipe structure (see paragraph 54, lines 1-6) including a plate for receiving a wafer to be baked (holding table mounting face 11a, see paragraph 54, lines 7-13), a heater for heating the plate (heater 17 heating a working fluid to expand throughout holding table 11, [0056]), and a cooling apparatus for cooling the plate [see paragraph 57]. Hisai et al. further disclose a thermostatic element (the combination of pipes 21 and 22, valve 26 and refrigerant supply source 25) adapted to maintain an approximately constant temperature of the coolant supplied into the heat pipe when the plate is cooled [the thermostatic element as taught by Hisai et al. has appropriate structure to perform this intended use function].

Hisai et al. fail to disclose a heat pipe for cooling the plate using vaporization of a coolant therein, the heat pipe arranged in proximity to the plate with the heater disposed therebetween; a coolant storage tank for supplying the coolant to the cooling element when the plate is cooled and for storing the coolant when the plate is heated. Hisai et al. also fail to disclose that the heat pipe is disposed external to the plate, the heat pipe and the plate being discrete elements and the heater being disposed between the heat pipe and the plate.

Hara et al. disclose a system including a plate (wafer chuck 91) for receiving a wafer (column 9, lines 15-20), and a cooling apparatus for cooling the plate, the cooling apparatus comprising: a heat pipe (interior of wafer chuck 91) for cooling the plate using vaporization of coolant therein (column 9, lines 41-63), the heat pipe arranged integrally with the plate (illustrated in figure 9); a coolant storage tank (97) for supplying coolant into the heat pipe when the plate is cooled (column 9, lines 19-21); and a thermostatic element (heat exchanger 2) for

maintaining an approximately constant temperature of the coolant supplied to the heat pipe when the plate is cooled (see column 5, lines 34-41).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the system of Hisai et al. to include the heat pipe and coolant storage tank for cooling the plate and the thermostatic element as taught by Hara et al. in order to maintain the wafer at a constant temperature, thus preventing deformation in the circuitry of the wafer.

Emoto teaches a temperature adjustment apparatus [see figure 4] that includes a wafer (1) disposed on a plate (3), a heating unit (30) disposed between the plate and cooling fluid container (7).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the baking system of Hisai et al. as modified by Hara et al. to include the plate as taught by Emoto in order to prevent the corrosion of the existing plate of Hisai et al., thus preventing malfunction of the system.

Furthermore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the baking system of Hisai et al. as modified by Hara et al. to include the heater being positioned between the plate and the heat pipe as taught by Emoto in order to provide quicker response to heating the wafer, thus increasing the efficiency of the system.

Regarding claims 3 and 4, Hisai et al. teach the limitation of providing a cooling water tank (25) for circulating cooling water through the heat pipe [see paragraph 58]; and a cooling

water supply line (22), which is a path of cooling water, that extends into the heat pipe and provides flow communication between the heat pipe and the cooling water storage tank [illustrated in figure 3 and see paragraph 58], and providing a valve (26) between the cooling water storage tank and the heat pipe [illustrated in figure 3].

Regarding claim 5, Hisai et al. as modified by Hara et al. teach all the limitations of the claimed invention, but Hisai et al. fail to teach the limitation of providing a coolant supply pipeline for providing flow communication between the coolant storage tank and the heat pipe.

Hara et al. disclose the limitation of providing a coolant supply pipeline (96) for providing flow communication between the coolant storage tank and the heat pipe (illustrated in figure 9; see column 9, lines 21-24).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the baking system of Hisai et al. to include the coolant supply pipeline as taught by Hara et al. in order to prevent the wick inside the heat pipe from drying out, thus increasing cooling efficiency.

Regarding claim 6, Hara et al. disclose the limitation of providing a valve (98) between the coolant storage tank and the heat pipe (illustrated in figure 9).

Regarding claim 7 Hara et al. disclose the limitation of the heat pipe having a ceiling portion and internal side portions (illustrated in figure 4 that the interior of wafer chuck 31, which corresponds to wafer chuck 91, has interior sides).

Regarding claims 12 and 24, Hara et al. disclose the limitation of providing a wick (38) on the ceiling portion and on the internal side portions of the heat pipe (illustrated in figure 4).

Regarding claim 13, Hisai et al. as modified by Hara et al. teach the limitation of the wick on the ceiling portion and the wick on the internal side portions of the heat pipe has a linear shape [as illustrated in figure 4, wick 38 is linear in shape], a spiral shape or a radial shape.

Regarding claim 14, Hisai et al. as modified by Hara et al. teach all the limitations of the claimed invention, but fail to teach the limitation of the wick on the ceiling portion having a different shape than the wick on the internal side portions of the heat pipe.

Although Hara et al. are deficient in providing the wick on the ceiling portion having a different shape than the wick on the internal side portions of the heat pipe, at the time the invention was made, it would have been an obvious matter of design choice to a person having ordinary skill in the art to provide a wick on the ceiling portion having a different shape than the wick on the internal side portions of the heat pipe, because the Applicant has not disclosed that providing a wick on the ceiling portion having a different shape than the wick on the internal side portions of the heat pipe provides a particular advantage, is used for a particular purpose, or solves a stated problem. One having ordinary skill in the art, furthermore, would have expected Hara et al.'s system, and Applicant's invention to perform equally well with either the wicks as taught by Hara et al. and the claimed wick on the ceiling portion having a different shape than

the wick on the internal side portions of the heat pipe because both wick configurations would perform the same function of transporting fluid via capillary action.

Regarding claim 15, Hisai et al. as modified by Hara et al. teach all the limitations of the claimed invention, but fail to teach the limitation of the wick plate on the ceiling portion having a plurality of planar wicks.

Although Hara et al. are deficient in providing the wick plate on the ceiling portion having a plurality of planar wicks, at the time the invention was made, it would have been an obvious matter of design choice to a person having ordinary skill in the art to provide a wick plate on the ceiling portion having a plurality of planar wicks, because the Applicant has not disclosed that providing a wick plate on the ceiling portion having a plurality of planar wicks provides a particular advantage, is used for a particular purpose, or solves a stated problem. One having ordinary skill in the art, furthermore, would have expected Hara et al.'s system, and Applicant's invention to perform equally well with either the ceiling wick as taught by Hara et al. and the claimed wick plate on the ceiling portion having a plurality of planar wicks because both wick configurations would perform the same function of transporting fluid via capillary action.

Regarding claim 16, Hara et al. teach the limitation of the wick on the ceiling portion and the wick on the internal side portions of the heat pipe has a linear shape [as illustrated in figure 4, wick 38 is linear in shape], a spiral shape or a radial shape.

Regarding claim 18, Hara et al. disclose the limitation of the heat pipe having a wick plate installed on the ceiling portion, and a wick plate installed on the internal side portions of the heat pipe (illustrated in figure 4 that the interior of the wafer chuck 31 corresponds to the wafer chuck 91 and has interior sides)

Regarding claim 21, Hisai et al. disclose the limitation of the coolant being water (see paragraph 93, lines 20-26).

Regarding claim 22, Hisai et al. teaches that the thermostatic element extends along the bottom surface of the heat pipe inside the heat pipe [illustrated in figure 3, pipe 21 is disposed along the bottom of the heat pipe], the bottom surface facing away from the heater [see the rejection of claim 1] and the thermostatic element being substantially submerged in coolant when coolant is supplied to the heat pipe [see paragraph 56, the steam being generated will submerge the thermostatic element].

Regarding claim 23, Hisai et al. as modified by Hara et al. and Emoto teach all the limitations of the claimed invention, but fail to explicitly teach that the heater extends along the entire top surface of the heat pipe.

The general concept of extending the heater to extend along the entire surface of the pipe falls within the realm of common knowledge as obvious mechanical expedient, and one having ordinary skill in the art would have been motivated to include the use of extending the heater to

extend along the entire surface of the pipe in order to increase heat transfer between the heater and the heat pipe, thus increasing system efficiency.

5. Claims 2, 10, 11 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hisai et al. as modified by Hara et al. as applied to claim 1 above, and further in view of Leffert (US 3,621,906).

Regarding claims 2, 10, 11 and 25, Hisai et al. as modified by Hara et al. teach all the limitations of the claimed invention, but fail to teach the limitations of providing a coolant flowing element for flowing the coolant into the heat pipe when the plate is cooled, wherein the coolant flowing element is a heater disposed inside and adjacent to the coolant storage tank for flowing the coolant into the heat pipe when the plate is cooled, and wherein the coolant flowing element is adapted to control fluid flow by varying pressure.

Leffert teaches the concept of providing a resistance heater with a control reservoir for increasing the vapor pressure in the heat pipe [see column 11, line 72 – column 12, line 9].

In regard to claims 2, 10 and 25, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the system of Hisai et al. as modified by Hara et al. to include the heater being disposed adjacent to the coolant storage tank as taught by Leffert in order to closely maintain the rate of heat transport from a heat source to the evaporator portion of the heat pipe at a level where the temperature under steady state conditions, thus maintaining a temperature less than that of the heat source.

In regard to claim 11, Although Leffert is deficient in providing the heater inside the coolant storage tank, at the time the invention was made, it would have been an obvious matter of design choice to a person having ordinary skill in the art to provide the heater inside the coolant storage tank, because the Applicant has not disclosed that providing the heater inside the coolant storage tank provides a particular advantage, is used for a particular purpose, or solves a stated problem. One having ordinary skill in the art, furthermore, would have expected Leffert's system, and Applicant's invention to perform equally well with either the heater disposed on the exterior the coolant storage tank as taught by Leffert or the claimed heater inside the coolant storage tank because both heater/coolant storage tank combinations would perform the same function of providing heating of the coolant storage tank.

Therefore, it would have been a prima facie case of obviousness to modify Leffert to obtain the invention as specified in claim 11 because such a modification would have been considered a mere design choice which fails to patentably distinguish over the prior art of Leffert.

Response to Arguments

6. Applicant's arguments with respect to claims 1-7, 10-16, 18 and 21-25 have been considered but are moot in view of the new ground(s) of rejection. Also, the Applicant contends that the cited references fail to teach or suggest a coolant storage tank adapted to store the coolant supplied to the heat pipe when the plate is heated and the absence of motivation of the combination of Hisai and Hara; and a thermostatic element adapted to maintain an approximately constant temperature of the coolant supplied to the heat pipe when the plate is cooled. The

examiner respectfully disagrees. The Hara reference was introduced to teach the addition of a coolant storage tank being connected to the heat pipe in order to supply the heat pipe with the coolant. Hara also teaches a wafer being disposed on top of a heat pipe. Since this is the case, and both Hisai and Hara teaches wafer exposure devices that allow placement of a wafer on top of a heat pipe, the motivation for the combination of Hara and Hisai is proper. Also, the Examiner has now interpreted the thermostatic element as being the combination of pipes 21 and 22, valve 26 and refrigerant supply source 25 of Hisai, since the interpreted thermostatic element has sufficient structure to provide for temperature control of the coolant inside the heat pipe. In conclusion, for at least these reasons, the Examiner respectfully submits that the rejections of the pending claims are properly upheld.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AZIM RAHIM whose telephone number is (571) 270-1998. The examiner can normally be reached on Monday - Thursday 7am - 3pm EST and Friday 7am - 9:30am EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Frantz Jules can be reached on 571-272-6681. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. R./
Examiner, Art Unit 3744
1/14/2008

/Frantz F. Jules/
Supervisory Patent Examiner, Art Unit 3744